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# Preliminary Draft Strategy for Use of ISM at TSCA PCB Cleanup Sites

EPA Region 9 // Prepared by C. Santos // Draft Strategy April 26, 2015 (Revised October 15, 2015)

## Introduction

The Interstate Technology Regulatory Council (ITRC) developed the Incremental Sampling Methodology (ISM), Technical and Regulatory Guidance (visit http://www.itrcweb.org) dated February 2012 (ITRC Guidance). This guidance states that "[i]ncremental sampling methodology (ISM) is a structured composite sampling and processing protocol that reduces data variability and provides reasonably unbiased estimate of mean contaminant concentrations in a volume of soil targeted for sampling. ISM provides representative samples of specific soil volumes defined as decision units (DUs) by collecting numerous increments of soil (typically 30-100 increments) that are combined, processed, and subsampled according to specific protocols."

The ITRC Guidance also states that: "The decision quality of relatively high-density discrete sampling plans compare favorably with ISM sampling plans. However, the analytical costs associated with such plans will likely be considerably greater than those of a comparable ISM approach." Page 32. And Section 3 states that "However, it is important to match the project objectives with the type of sampling employed. For some objectives discrete sampling is appropriate (when sufficient numbers of discrete samples are used); for others, ISM sampling is the best option."

In general ISM was developed to address the heterogeneous nature of soils and reduce sampling and pre analysis sample preparation errors.

## Discrete and ISM Samples

Discrete samples collected from a certain specific area may not be representative of the volume of soil that was sampled due to the heterogeneity of contaminant distribution in that volume of soil. Two discrete samples may be collected nearby each other and the analysis may yield very different results. The sioze of the discrete sample and the size of the aliquot from the field sample to be prepared for analysis also impact the analytical results due to soil heterogeneity and particle size. Discrete samples may not be homogenized in the laboratory and subsampled, where the subsample would be that aliquot (or portion) from the sample to be extracted and analyzed. In that sense, precision and accuracy of analytical results for discrete samples may be impacted.

When soil samples are collected via ISM, 30 or more increments of soils are collected, combined into one sample, homogenized, subsampled, extracted, and analyzed. In brief, this process is to reduce field sampling variability due to soil heterogeneity, reduce variability in analytical results, and achieve analytical results that are more representative of the contaminant concentration in the soil volume that was sampled.

However, based on the ITRC Guidance, collection of a number of discrete samples equivalent to the number of increments collected via ISM and homogenized and subsampled in same manner as ISM samples are likely to address soil heterogeneity and variability in the analytical results. The use of statistics to evaluate the discrete soil analysis results such as EPA's ProUCL program would help further minimize sample variability and analytical errors. A 95% upper confidence limit of the mean can be calculated using the discrete sample analytical results. Variability within the sample is caused by heterogeneous soil particle distribution in the sample and stratification of soil particles within the sample inside the sampling jar and from which an aliquot is usually collected for extraction and subsequent analysis. In contrast to ISM, discrete samples can provide information on the spatial variability of contaminant distribution in the soil volume of interest while ISM cannot as the ISM sample represents an estimate of the mean contaminant concentration in the volume of soil that was sampled.

Another issue is cost. The ITRC Guidance states that cost are higher for sampling plans involving discrete samples compared to ISM. We believe that ISM costs may be high as well due to the labor involved to

collect field samples (30 to 100 increments), replicate field samples (another one or two rounds of 30 to 100 increments each), and the labor incurred at the laboratory to do the sample processing described in the ITRC Guidance.

## General Strategy

### 1. As-found (In-situ) PCB Concentration

Incremental samples must be collected in-situ before soil is excavated and / or stockpiled. EPA may consider the ISM sample resulting from the combination of all in-situ collected incremental samples as the as-found estimated mean PCB concentration in the volume of soil sampled within a DU.

### 2. Risk-Based Disposal Approval, Land Use Covenants, Redevelopment

Under 40 CFR 761.61(c), EPA may approve the use of ISM at TSCA PCB cleanup sites.

The risk-based cleanup approval includes flexible language that allows EPA the option to require, on a site-specific basis, the use of sampling techniques not limited to ISM and that are most appropriate for site characterization, cleanup verification, and offsite disposal of bulk PCB remediation waste.

The approval includes language giving EPA the flexibility to require additional characterization if the land use at a site changes after the cleanup has been completed or the DU (parcel to be redeveloped) is to be subdivided into smaller areas or lots. In these situations, EPA may require sampling techniques for re-characterization of a site or portion thereof that may include or exclude ISM regardless of whether ISM was used in the initial characterization.

If cleanup verification data shows the site or portion thereof needs to be re-cleaned to meet established cleanup levels, the details of how that will be done must be clearly described and discussed in an amendment to the cleanup plan.

If waste is to be disposed onsite, sampling and analytical results and survey coordinates would be used to document the location of the bulk PCB remediation waste(s). Cap and land use covenant requirements apply.

### 2. Site Characterization, Cleanup, and Cleanup Verification (Anti-dilution, PCB Cleanup Site)

EPA reviews all relevant site-specific information to determine the adequacy of the type, size, and number of decision units (DU designation) that were or will be used in subdividing the site to assess the vertical and horizontal extent of PCB contamination. This information will also be used to designate the PCB cleanup site. Examples of this information include:

- operational and ownership history;
- comprehensive and complete site conceptual model;
- known vertical and horizontal extent of PCB contamination;
- information suggesting presence of source areas;
- data suggesting or confirming probability that “hot spots” may be present; and level of confidence on quality and accuracy of such data;
- DU designations
- presence of other contaminants that may increase mobilization of PCBs;
- site description including maps, figures, and photos;

- sampling/laboratory analytical data;
- types of soils and geological features;
- planned and current land site and surrounding land uses;
- details on future uses and redevelopment projects for the site;
- sensitive environments and receptors; and
- location of surface water relative to the site.

Implement approaches that facilitate collection of sufficient quality samples to determine, as feasible, the spatial distribution of PCB contamination to properly identify (1) source areas at the site and (2) the PCB cleanup site boundaries; and to more accurately segregate bulk PCB remediation waste for disposal. For example, depending on site-specific circumstances, EPA may consider a combination of any of the following:

- small size DUs
- subdivision of DUs into sampling units
- source DUs
- high density discrete samples combined with exposure DUs
- high density discrete samples combined with source DUs

EPA may consider the use of ISM at PCB sites for cleanup verification only and the use of other sampling techniques such as high density discrete sampling for site characterization.

EPA may consider ISM alone, ISM combined or supplemented by other sampling techniques such as high density discrete samples or high density discrete sampling methods for both site characterization and cleanup verification.

Replicate and quality control ISM samples should be collected.

The applicability of statistics to ISM site data to make site-specific risk-based decisions need to be further evaluated to determine if statistics can be applied to the data.

The results of high density discrete samples would be statistically evaluated to supplement ISM data for risk decision making.

## 4. Offsite and Onsite Disposal

Offsite Disposal

Refer to Item 3, Site Characterization.

If ISM sample results are equal to or above 50 ppm, the following scenarios should be considered:

- the entire soil volume sampled within the DU may be disposed at a RCRA Subtitle C permitted or TSCA approved landfill or
- the DU is subdivided and further characterized to determine more accurately the soil volumes that must be disposed as remediation waste containing PCBs equal to or above 50 ppm or
- the EPA-approved cleanup plan includes onsite disposal with capping.

If ISM sample results for bulk PCB remediation waste are below 50 ppm, the entire soil volume represented by the ISM sample may be disposed at a state-permitted municipal solid waste or

construction debris landfill. However, replicate ISM characterization samples should be collected to further assess the variability of PCB concentrations within the DU.

Onsite Disposal

Refer to Item 3, Site Characterization

EPA will make site-specific decisions regarding best sampling approach or combination of sampling strategies at cleanup sites under 761.61(c) when bulk PCB remediation wastes may be left in place.

Sampling and analytical results and survey coordinates would be used to document the location of the bulk PCB remediation waste(s) disposed onsite. Cap and land use covenant requirements apply.

## 5. No Unreasonable Risk Determination

The determinations are to be made upfront based on site characterization data and the cleanup approach. Refer to Item 3, Site Characterization.

The no unreasonable risk determination for the site or a portion thereof would be based on ISM sample(s) results; and/or the results for other types of samples that may be collected at the site.

The ISM results represent the estimated mean concentration of PCBs in the volume of soil sampled within a DU. Exposure DUs may be designated at a site for risk decision making in addition to other types of DUs such as source DUs.

Risk-based decisions may be based on the estimated PCB mean concentration within a DU. Depending on how many ISM samples are collected at a site for decision making, it may not be possible to use statistics to evaluate the ISM data. Currently, under 761.61(c), a no unreasonable risk determination may be made based on several factors including the 95% upper confidence limit of the mean (using methods such as EPA's Pro-UCL statistical program) of the PCB sample results.

## 6. ISM Sample Preparation at Laboratory and Discrete Samples

EPA's Soxhlet (SW 846 Method 3540C) and Ultrasonic (SW 846 Method 3550C) extraction methods specify a sieve size equal to 1 millimeter for sample preparation and this specification must be followed even when using the ITRC Guidance as reference. The samples for PCB analysis should be dried as specified in the PCB extraction methods.

Collect discrete samples in larger volumes or in similar volumes as those used for incremental samples. Include in the cleanup plan that discrete samples be processed in similar manner as ISM samples except that discrete samples will not be combined but analyzed individually.